Statistics 421/621 – Applied Time Series and Forecasting
Spring 2016

Lecture: MW 2-3:15pm**,** DH 1070
Discussion Session: TBA

Instructor: Dr. Kathy Ensor; x4687; ensor@rice.edu
Office Hours: Monday from 11am to noon or by appointment

TA: Kim Raath, kcr2@rice.edu
Discussion Sessions: Doodle Poll for Tuesday's : http://doodle.com/poll/98kxev4hm4qcpi5f

Course Objective: To educate students on the foundation and practical implementation of time series methods and forecasting. Examples will come primarily but not solely from a broad spectrum of problems in engineering, science and business, specifically finance.

Textbook: The main text for the course is:

- *The free text by Shumway and Stoffer, The easy version of Time Series Analysis and Its Applications http://www.stat.pitt.edu/stoffer/tsa3/tsa3EZ.pdf.* Although you don't need to do so for the course, I do recommend buying a hard copy of their time series book. It will prove a great resource on your bookshelf.
- *Another free text on simple Forecasting: principles and practice by Rob J. Hyndman and George Athanasopoulos is found at https://www.otexts.org/fpp.* We will use this text at the beginning of the course while studying simple forecasting strategies.
- *In the past I have used: The Analysis of Financial Times Series* by Ruey Tsay, 3rd Edition (Data sets; errata). This is an excellent text that provides another perspective. There should be copies around.

Computing Required: This course will require a substantial amount of computing and data analysis, relying on the statistical software package R (https://www.r-project.org/). We will include useful resources for time series with R on the course Canvas site.

Assessment:

- 30% Midterm Exam – in class – target date February 22nd (subject to change with sufficient lead time)
- 40% Final Exam – comprehensive exam scheduled by the Registrar
- 30% Quizzes, class participation, and homework.
- There will be additional exam and homework questions for STAT 621 students based on the assumption of graduate level background knowledge in statistics.

HW may be assigned but not graded. **Graded HW's will be pledged assignments.** When HW is not graded, HW assessment will come in the form of in class quizzes related to the homework.

Attendance: Although attendance is not formally required students will benefit from regular attendance. Further, there is an in class participation component to the grading. If you do miss class you are responsible for getting notes and assignments.

Piazza: Sign up at: piazza.com/rice/spring2017/stat421621. Please direct questions to the course Piazza page (piazza.com/rice/spring2017/stat421621/home) so that the instructor, TA, and other students can help answer questions and moderate discussions. Piazza contribution will be considered as part of course participation.

Problem Sessions: The TA will hold problem session(s) to review class material, review the use of R, and work through example problems. Please indicate preferred times at: http://doodle.com/poll/98kxev4hm4qcpi5f**.** Attendance at the problem sessions is not required, but strongly encouraged.

Disabilities: I encourage any student with a disability that requires accommodation to let me know as well as Rice Disability Support Services.

High Level List of Topics:

- Basic time series decomposition, smoothing and forecasting.
- Stochastic process structure, notation, stationary process, temporal dependence and forecasting.
- Linear time series models including ARIMA, ARIMA, ARIMAX.
- Spectral Methods
- Multivariate linear time series models (VAR, VARX)
- Nonlinear TS models such various GARCH models.
- State-space models (if time); Stochastic Volatility Models